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Revenue sharing in professional sports leagues: for the sake of competitive balance or as a result of monopsony power?

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Abstract

We analyze the distribution of broadcasting revenues by sports leagues. In the context of an isolated league, we show that when the teams engage in competitive bidding to attract talent, the league's optimal choice is full revenue sharing (resulting in full competitive balance) even if the revenues are independent of the level of balancedness. This result is overturned when the league has no monopsony power in the talent market. When the teams of two different leagues bid for talent, the equilibrium level of revenue sharing is bounded away from the full sharing of revenues: leagues choose a performance-based reward scheme. Finally, we argue that our model explains the observed differences in revenue sharing rules used by the U.S. sports leagues (full revenue sharing) and European soccer leagues (performance-based reward).

1 Introduction

The organization of professional sports in the United States differs from the one in Europe in that for each sport, there is one main league (NBA for basketball, MLB for baseball, NFL for football and NHL for hockey). Consequently, since the movement of talent across the Atlantic is negligible, leagues in the United States enjoy a monopsony position in the market for talent. Thus, when American teams compete to attract the best players, only the distribution of talent is affected, while the total amount of talent in the league stays constant.

Conversely, Europe is characterized by one main sport (soccer) and in each country there is a top domestic league (Premiership in England, Première Division in France, Serie A in Italy, Liga in Spain, ...). As a result, European leagues can increase their total amount of talent (and hence, their attractiveness to broadcasters) by poaching star players from a foreign league. For example, one can reasonably assert that when the Brazilian superstar Ronaldo was traded from Barcelona (Spain) to Internazionale (a team from Milan, Italy), the attractiveness of the Spanish league decreased, while that of the Italian League increased.¹ Therefore, in Europe, not only the teams, but the leagues as well have incentives to compete for talent.

Another difference between the United States and Europe is the revenue sharing

¹Further evidence of the enhanced attractiveness of leagues with the highest concentration of star players (Italy and Spain) is that every weekend a game from the Italian Serie A is broadcasted in England (ITV) and in the Netherlands (Canal+) and top games from the Spanish Liga and Serie A are broadcasted in France (Canal+)

rules used by the leagues. In the United States, revenues from national TV deals are shared in an egalitarian way. As Scully (1995) explains, "National rights are evenly split among the clubs in the leagues without regards to the performance of particular clubs. It is assumed that these shared revenues are determined by league-wide talent levels." In contrast, in Europe, the amount a team receives is closely related to its results obtained in the competition² (see Tables 1 and 2).

The goal of this paper is to show that the use of performance-based reward schemes by European soccer leagues can be explained by the competitive environment in which they operate. Conversely, the traditional argument of a demand for a balanced distribution of talent does not in itself explain the equal division rule used in the United States.

The intuition for our result is the following. If inter-league movements of players are not restricted and league-wide talent levels influence the revenue leagues get from national TV deals, then leagues compete for superstar players. However, they cannot do it in a direct way, since players are hired by teams. Hence, a league wishing to attract top players must provide the incentives for domestic teams to bid a higher price than foreign teams. Now, the value of a player who increases the probability of winning increases with the amount awarded to the winner. Hence, a performance-

²There is also less revenue sharing of gate income in European soccer leagues than in most of US sports leagues. For example, in England and Italy, there is no sharing of gate income while in Germany only 6% of gate income is paid to the league. In the NFL, 40% of net gate income goes to the visiting team. In baseball, 10% and 20% of gate income go to the visiting team in the National League and in the American League, respectively.

based reward increases the price domestic teams are willing to bid for top players.

By the above argument, one could rush to the conclusion that competing leagues should choose a winner-takes-all reward scheme. There are two main reasons why this is not so. First, the teams that effectively buy the top players face the risk of bankruptcy if they do not end up winning the competition. Since this risk is increasing in the winner's share, there is a trade-off. Second, leagues care also about the competitive balance of the championship they organize. Hence, if the difference of wealth between teams from the same league became too large, the top players would be concentrated in a very small number of teams, decreasing the uncertainty of many games, which would influence negatively the revenue the league raised from TV deals.

A special feature of our model is the bidding mechanism we posit for the competitive allocation of talent, which is closely related to recent work on auctions with externalities (see Jehiel and Moldovanu, 1996, and Jehiel et al., 1996). These auctions are characterized by interdependent valuations, where a bidder does not only care about winning, but also about who gets the object in case she does not win. In our model, if the winner of the auction is from the same league, then losing is not as harmful, since even though the team gets a smaller share, the total revenue of the league will remain high. However, if the winner is from the other league, the loss with respect to winning the auction is much higher, since the aggregate talent level of the league decreases.

Several papers have studied the influence of revenue sharing on the demand for sport (El Hodiri and Quirk, 1971, Atkinson, Stanley and Tschirhart, 1988, Fort and

Quirk, 1995, Vrooman, 1995). However, they focus on the optimality of cross subsidies as used in the monopsonistic³ economy of the United States and do not study the implications of performance-based revenue sharing rules.

The papers most related to ours are those of Hoehn and Szymanski (1999) and Palomino and Rigotti (2000). As our model, Hoehn and Szymanski compare a league operating in a competitive environment and an isolated one. They study the impact of the participation of top clubs in international competitions on the competitive balance of the domestic leagues. They do not address the issue of the optimal level of revenue sharing. Palomino and Rigotti consider a multi-period situation in which the demand for sport depends on the aggregate talent level, competitive balance and the effort produced by teams. They show that demand maximization does not lead to full revenue sharing, since even though revenue sharing fosters competitive balance among teams, it also lowers their incentives to win (and hence their equilibrium level of effort).

While our main goal is to provide for an economic rationale for the observed differences between the U.S. and European sports leagues, the underlying intuition is exportable to other spheres of economic activity. Consider, for example, oligopolistic firms of different countries competing for (scarce) foreign direct investment. In this

³Fort and Quirk (1995) do address the issue of rival leagues in the US context. However, their main conclusion is that the existence of competing leagues has been a transitory phenomenon, and the profit motives have always led either to a merger or to an exit. In Europe, at least to date, because of the national nature of the leagues, steady state rivalry is feasible. Note however, that the introduction of the Champions' League was a move in the same direction.

set-up, our results imply that, in equilibrium, the governments of these countries would put relatively lenient competition policy barriers in place, in order to enhance their 'firms' competitive position.

The organization of the paper is as follows. Section 2 presents the model. Section 3 considers the case of isolated leagues. Section 4 analyzes the competition between leagues and Section 5 argues the robustness of our results. Finally, Section 6 concludes.

2 The model

We present the simplest possible model that still enables us to address the issue of optimal revenue sharing when there is (potential) competition for players between leagues.⁴ There are 2 leagues, a and b . Each league is made up of two teams, $t_{j,1}$ and $t_{j,2}$ ($j = a, b$). Each team is composed of one player and teams of the same league compete in a championship.

There are five potential players: four players of (relatively) low talent (l players) and one player of high talent (h player). The quality of the players influences the probability that a team wins the competition. If both teams in a league are composed of l players (l teams), their probability of winning the championship is $1/2$ each. A team with a h player (h team) opposed to a l team has a probability $3/4 > 1/2$ of winning the championship.

⁴In the Discussion, we will argue that our findings are robust to generalizations of this model.

Each league j ($j = a; b$) has an amount K_j of broadcasting revenue to split between the winner and the loser of the championship it organizes. We denote $\alpha_j \in [0, 1]$ the share which is awarded to the winner. Thus, α_j represents the level of revenue sharing chosen by league j . The two extreme cases are $\alpha_j = 1/2$ and $\alpha_j = 1$; which correspond to the league choosing full revenue sharing (thus not rewarding the teams on the basis of their performance) and to a contest, where the winner takes all, respectively.

The amount K_j league j has to split depends on the quality of the players involved in the league. The idea is that leagues sell the rights to broadcast the competition to TV networks and the price networks are willing to pay depends on the quality of the competition, i.e., the quality of the players involved in the league. Let $K(q_1; q_2)$ be the price paid by a network if the two teams participating in the league are of quality q_1 and q_2 . We assume that $K(h; l) = K > K(l; l) = 0$. Two factors influence the demand for sport, the skills of the players and the uncertainty of the outcome. The inequality $K(h; l) > K(l; l)$ means that the skill effect dominates the uncertainty one and $K(l; l) = 0$ means that there is no demand for games played only by low talent players.⁵

Following Atkinson, Stanley and Tschirhart (1988), we assume that the objective of each league is to choose a level of revenue sharing (α) so as to maximize the aggregate profit of its teams. That is, in addition to its revenue from TV deals (K), a league also internalizes the cost that obtaining the high player inflicts on one of its

⁵Our model thus fits Rosen's (1981) definition of Superstars: a small percentage of an already reduced field of agents who are responsible for most of the traded volume.

teams.⁶

The objective of the teams is to maximize their expected profit. Teams compete with each other on two levels. First, they compete in an auction to attract the h player. Second they compete "on the field" with the other team from the same league. We assume that team i ($i = 1; 2$) from league j ($j = a; b$) has an initial wealth $W_{j;i}$ and that in the auction, a team cannot bid higher than its initial wealth (infinite cost of bankruptcy). This implies that the highest price team i from league j can bid is

$$B_{j;i} = (1 - \alpha_j)K + W_{j;i} \quad (1)$$

We consider the following sequence of events: Leagues a and b choose simultaneously their level of revenue sharing α_a and α_b , respectively. Teams observe α_a and α_b and simultaneously make salary offers to the h player. Following Jehiel and Moldovanu (1996), in order to obviate existence issues, we assume that there is a smallest monetary unit ϵ . The h player accepts the highest bid.⁷ If several teams make the highest bid, the h player chooses a team randomly. The losing teams are allocated one l player each at zero cost. Finally, the championship takes place.

⁶In the Discussion, we will explain how our results change if this assumption is relaxed.

⁷Note that this mechanism is not optimal for the h player: he could extract more rent in a menu auction (see Bernheim and Whinston, 1986), where the losing teams of the same league as the winner would also pay for the positive externality created by the h player's presence in the league.

3 The benchmark case: Two isolated leagues

As a benchmark, we consider the case in which players cannot move across leagues. This corresponds to the case of US sports leagues, in the sense that the total talent level of the league is constant. Of course, we are neglecting variations of total talent due to the arrival of a young player or the retirement of an old one. Without loss of generality, we assume that player h is allocated to league a . Hence, competition for player h is only between teams $t_{a;1}$ and $t_{a;2}$, the revenues from TV deals for league a is K and it is 0 for league b .

In such a situation, when deciding how much to bid for the acquisition of the h player, a team knows that if it does not acquire the h player, then its opponent will. Hence, for any $\alpha_a \in [1, 2]$, the value of the h player for team $t_{a;i}$ ($i = 1, 2$) is

$$V(\alpha_a) = \left(\frac{1}{4}\alpha_a + (1 - \alpha_a)\left(1 - \frac{1}{4}\right)\right)K - \left(\frac{1}{4}(1 - \alpha_a) + \alpha_a\left(1 - \frac{1}{4}\right)\right)K \quad (2)$$

The first term represents the gain of a h team when opposed to a l team while the second term represents the expected gain of a l team when opposed to a h team. Note that $V(\alpha_a)$ can be rewritten as

$$V(\alpha_a) = (2\alpha_a - 1)\left(2\frac{1}{4} - 1\right)K \geq 0 \quad (3)$$

When a league is isolated, its revenue is independent of the level of revenue sharing it chooses. However, the level of revenue sharing does affect the price paid for the h player. Therefore, the league chooses the value of α that minimizes the transfer from the teams to the players. Without loss of generality, assume that $W_{a;1} \geq W_{a;2}$. Then

in the auction, team $t_{a;1}$ sets the price. It bids $\min \{V(\theta_a); B_{a;2} + \epsilon\}$ if $W_{a;1} > W_{a;2}$, while it bids $\min \{V(\theta_a); B_{a;2}\}$ if $W_{a;1} = W_{a;2}$. Given this, the optimal choice of the league can be obtained easily:

Proposition 1 When the league's objective is to maximize the total financial wealth of teams, it sets $\theta^a = 1=2$.

Proof: Since the revenues are constant, the league wants to minimize the price paid for the h player. Given the equilibrium bids derived above, the result follows directly from the fact that $V(\theta)$ is increasing in θ ; and that $V(1=2) = 0$. ²

Hence, an isolated league representing the team owners has incentives to choose full revenue sharing even in the absence of any competitive balance consideration.

In our simple model, this solution would leave the teams without an incentive to win and, therefore, star players would earn the same salary as low quality players. This extreme result is due to the fact that we have not taken into account additional performance-related revenues for the teams like merchandising, or local TV deals, which are not re-allocated by the league. In addition, it is widely recognized that teams (both owners and players) have non-pecuniary incentives to win as well.

4 Competition between leagues

In this section, we open up the domestic player markets to international competition. Thus, in principle, all four teams are bidding for the services of the h player. At the same time, the leagues' choices of the levels of revenue sharing are transformed from two independent decision problems into a non-cooperative game, where we look for a Nash equilibrium in pure strategies.

By varying α_i , the share of revenues awarded to the winner of the championship, a league can affect two things: the identity of the team who obtains the services of the h player, and the price paid for him. With respect to the first of these, a league only cares about which league the h player ends up in, since league revenues are a function of total talent. Moreover, by the individual rationality of each team, the equilibrium price will always be such that the league, even if it internalizes this expenditure, will always prefer to have the h player. Consequently, in order to find the pure strategy Nash equilibria in the choice of α_i , we can focus on the (two-dimensional) binary function, $J : [0, 1]^2 \rightarrow \{a, b\}$ which shows for each possible pair (α_a, α_b) which league obtains the services of the h player.⁸

Lemma 1 There are two possible types of pure strategy Nash equilibrium. Either one league attracts the h player with certainty or, since the highest bids from the two leagues coincide, the h player can go to either league with positive probability. For a given pair (α_a, α_b) to form a Nash equilibrium of the first type a necessary condition is

⁸Strictly speaking, the function is slightly more complicated, since at the frontier between two areas where the h player goes to a different league it is possible that the assignment is probabilistic.

that given the θ of the winner (the league which attracts the h player) the J function is constant in the θ of the loser. For an equilibrium of the second type the necessary and sufficient condition is that $J(\theta_i; x) = v_i$ ($i = a; b$) for all $x \in \theta_j$ ($j \in i$).

Proof: For the non-random equilibrium note that, if the condition were not satisfied, the loser league could deviate and attract the h player. The necessity part of the other equilibrium follows by the same argument (and the fact that by the strict monotonicity in θ of the willingness to pay, the undetermined regions of the J function (c.f. footnote 8) are of measure zero, even marginally). To see that in that case the condition is also sufficient, just note that any deviation would strictly decrease the deviator's profit. ²

Under more restrictive assumptions, we can show that the necessary condition is sufficient as well.

Corollary 1 The necessary condition for a non-random equilibrium in Lemma 1 is also sufficient if either only one team from each league can bid for the h player or the leagues maximize revenues.

Proof: If the leagues do not internalize the expenditures of their teams (that is, they maximize revenue), then if the condition is satisfied, the winner league does not want to, while the loser league cannot vary the outcome. If there is only one team bidding per league, then the price paid for the h player is constant in the winner's θ ; since it is determined by the willingness to pay of the team from the other league. ²

Using Lemma 1 and Corollary 1, we can give a useful description of the equilibrium outcomes, based on the J function. As a first approximation, let us restrict attention to the case where only the richer team of each league bids for the h player.⁹ As the following lemma shows this is a meaningful exercise, since the equilibria of the unrestricted game form a subset of the equilibria of the restricted one.

Lemma 2 In the game between the two leagues, any equilibrium revenue sharing levels when all four teams bidding are also an equilibrium when only the richer teams are bidding in each league.

Proof: Take any equilibrium in the unrestricted game. By Lemma 1 it must satisfy a necessary condition, which for the restricted game is sufficient for equilibrium, by Corollary 1. ²

In order to characterize the J function, we need to solve for the equilibrium continuation following an arbitrary choice of revenue sharing rules by the two leagues. In the restricted game, the opportunity cost of losing the auction differs from that of the previous section, since the rich team which does not obtain the h player will compete in an $(l; l)$ league. Consequently, we have that the value of the h player for team $t_{i;1}$ is

$$V^c(r_i) = (\frac{1}{4}r_i + (1 - r_i)(1 - \frac{1}{4}))K: \quad (4)$$

⁹We assume { without loss of generality { that team 1 is the richer one in each league: $W_{j;1} \geq W_{j;2}$ ($j = a; b$).

Given our assumption that bankruptcy is infinitely costly, the willingness to pay of team $i;1$ is then given by

$$\min_{\mathbb{R}_i} f(V^c(\mathbb{R}_i); B_{i;1})g = \min_{\mathbb{R}_i} f(\frac{1}{4}\mathbb{R}_i + (1 - \mathbb{R}_i)(1 - \frac{1}{4}))K; (1 - \mathbb{R}_i)K + W_{i;1})g: \quad (5)$$

Straightforward algebra reveals the following.

$$V^c(\mathbb{R}_i) \geq B_{i;1}, \quad \mathbb{R}_i \geq 1/2 + \frac{W_{i;1}}{2\frac{1}{4}K}; \quad (6)$$

$$V^c(\mathbb{R}_i) \geq V^c(\mathbb{R}_j), \quad \mathbb{R}_i \geq \mathbb{R}_j; \quad (7)$$

$$V^c(\mathbb{R}_i) \geq B_{j;1}, \quad \mathbb{R}_i \geq \frac{\mathbb{R}_j}{1 - \frac{1}{2}\frac{1}{4}} + \frac{\frac{1}{4}K + W_{j;1}}{(2\frac{1}{4} - 1)K}; \quad (8)$$

$$B_{i;1} \geq B_{j;1}, \quad \mathbb{R}_i \geq \mathbb{R}_j + \frac{W_{i;1} - W_{j;1}}{K}; \quad (9)$$

Figure 1 shows the J function as derived from these six inequalities (c.f. the proof of Proposition 2).

Insert Figure 1 here

Proposition 2 If only the richest team in each league bids for the h player then if $W_{i;1} > W_{j;1}$ then the set of equilibria are any pair $(\mathbb{R}_i; \mathbb{R}_j)$ such that $\mathbb{R}_j \geq [1/2; 1]$ and $\mathbb{R}_i \geq 1/2 + \frac{W_{j;1}}{2\frac{1}{4}K}; 1/2 + \frac{W_{j;1}}{2\frac{1}{4}K} + \frac{W_{i;1} - W_{j;1}}{K}$: If $W_{i;1} = W_{j;1}$ then the unique equilibrium is $1/2 + \frac{W_{j;1}}{2\frac{1}{4}K}; 1/2 + \frac{W_{j;1}}{2\frac{1}{4}K}$:

Proof: Let $W_{i;1} > W_{j;1}$: By solving for the crossing points of the lines in Figure 1, it is straightforward to show that the points $X = 1/2 + \frac{W_{j;1}}{2\frac{1}{4}K}; 1/2 + \frac{W_{j;1}}{2\frac{1}{4}K}$ and $Y = 1/2 + \frac{W_{j;1}}{2\frac{1}{4}K} + \frac{W_{i;1} - W_{j;1}}{K}; 1/2 + \frac{W_{j;1}}{2\frac{1}{4}K}$ are to the left and right, respectively, of $Z = 1/2 + \frac{W_{i;1}}{2\frac{1}{4}K}; 1/2 + \frac{W_{j;1}}{2\frac{1}{4}K}$. Similarly, the sign of the slopes of all the lines are

as drawn. Thus, all we need to do is to deduce the value of the J function in the different areas. To the North-West of Z , the relevant values of the willingness to pay are $B_{b;1}$ and $V^c(\mathbb{R}_a)$: Consequently, in this region the relevant inequality is (8) with $i = a$ and $j = b$: To the North-East of Z , the relevant values of the willingness to pay are $B_{a;1}$ and $B_{b;1}$: Consequently, in this region the relevant inequality is (9): To the South-East of Z , the relevant values of the willingness to pay are $B_{a;1}$ and $V^c(\mathbb{R}_b)$: Consequently, in this region the relevant inequality is (8) with $i = b$ and $j = a$: Finally, to the South-West of Z , the relevant values of the willingness to pay are $V^c(\mathbb{R}_a)$ and $V^c(\mathbb{R}_b)$: Consequently, in this region the relevant inequality is (7): Therefore, the J function is as drawn on Figure 1 and thus by Lemma 1 the Proposition's conditions are necessary, and by Corollary 1 sufficient. When $W_{i;1} = W_{j;1}$, X , Y and Z coincide. In this case, by Lemma 1 we have a unique type 2 equilibrium, at the crossing point. ²

Figure 1 illustrates Proposition 2. In regions 1 to 4, the h player goes to league b : In the other regions, he goes to league a : Hence, by Lemma 1, all equilibria are such that $\mathbb{R}_a \geq \underline{\mathbb{R}_a}, \mathbb{R}_b$: the equilibrium revenue sharing rule of the richer league is of intermediate level. The elimination of low \mathbb{R} 's is a straightforward consequence of the league's interest in providing strong enough incentives for its team to bid for the h player. The elimination of the high \mathbb{R} 's is, in turn, driven by the bankruptcy constraint (c.f. (1)): if incentives are high-powered, the losing team earns very little and thus the bankruptcy constraint becomes binding at a low level.

Proposition 2 in conjunction with Lemma 2 states that the league attracting the h

player never chooses full revenue sharing in equilibrium. It should be remarked that in Proposition 2, the price effects does not play any direct role in the determination of the equilibrium levels of revenue sharing. As a consequence, the set of equilibria remains rather large, especially so for the poorer league, whose equilibrium level of revenue sharing is unconstrained. This is due to the restricted competition, that is, only the rich teams are bidding for the h player. Taking account of the behavior of the poor teams in both leagues can significantly refine the set of equilibria. Most notably, it can eliminate low ϕ 's as equilibrium behavior of the poorer league. To see why, observe that the equilibrium price paid by the team who acquires the services of the h player is determined by the second highest willingness to pay, which may be of the other team of the same league. In such a case, by lowering ϕ , the league can decrease the price without losing the h player (holding the poorer league's ϕ constant). On the other hand, as a best response to this lower ϕ , the poorer league may be able to attract the h player by setting a more performance driven revenue sharing rule (higher ϕ). Hence, the objective of the richer league is to minimize ϕ under the constraint that the poorer league does not obtain the h player. We now develop this intuition in more detail.¹⁰

Without loss of generality, assume that $W_{a;1} > W_{b;1}$. Furthermore, assume that league b chooses $\phi_b = 1/2$. In that case $V^c(\phi_b) < B_{b;1}$ and thus the budget constraint is not binding for the teams in the losing league. Now, consider the (non-empty) set

¹⁰The full characterization of equilibria for all parameter values is quite straightforward, but lengthy and tedious, while it does not add much intuition.

of \mathbb{R}_a such that

$$V^c(1=2) < V(\mathbb{R}_a) < B_{a,2} < B_{a,1} < V^c(\mathbb{R}_a): \quad (10)$$

In such a situation, the two teams from league a compete for the h player and bid $V(\mathbb{R}_a)$. It follows that league a chooses \mathbb{R}_a so that the price paid for the h player is minimized, subject to the constraint that the inequality $V^c(1=2) < V(\mathbb{R}_a)$ still holds (and thus the league does not lose the h player). Since $V(\mathbb{R}_a)$ is increasing in \mathbb{R}_a , the best reply of league a to $\mathbb{R}_b = 1=2$ is \mathbb{R}_a^0 such that $V(\mathbb{R}_a^0) = V^c(1=2) + \epsilon$. Now, if there exists \mathbb{R}_b such that $V^c(\mathbb{R}_b) < V^c(\mathbb{R}_a^0) < B_{b,1}(\mathbb{R}_b)$, then league b can attract the h player when league a sets \mathbb{R}_a^0 . Consequently, there is no equilibrium such that $\mathbb{R}_b = 1=2$. This situation is illustrated by Figure 2 where \mathbb{R}_i^c is the solution of $V^c(\mathbb{R}) = B_{a,i}(\mathbb{R})$ ($i = 1, 2$) and \mathbb{R}_i^0 is the solution of $V(\mathbb{R}) = B_{a,i}(\mathbb{R})$: For any pair $(\mathbb{R}_a, \mathbb{R}_b)$ in the grey region, inequalities (10) hold. The best reply of league a to $\mathbb{R}_b = 1=2$ is \mathbb{R}_a^0 and any best reply of league b to \mathbb{R}_a^0 is $\mathbb{R}_b \geq (\mathbb{R}_b^0, \mathbb{R}_b^{00})$.

Proceeding as above, one can show that for any parameter specification such that $\mathbb{R}_a^0 < \underline{\mathbb{R}}_a$, there exists $\underline{\mathbb{R}}_b > 1=2$ such that $\mathbb{R}_b \in [\underline{\mathbb{R}}_b, \underline{\mathbb{R}}_b]$ in equilibrium. Hence, both leagues must choose a performance-based reward scheme in equilibrium.

Insert Figure 2 here

5 Discussion

In this section, we will argue that the conclusions based on the analysis of the seemingly restrictive model of the previous sections are surprisingly(?) robust.

We have assumed that the objective function of the leagues is to maximize their domestic aggregate net surplus. This may not be the case in general, since not all teams incur the cost of hiring talent with equal probability. In this case, teams are likely to bargain over the fraction of expenses the league should internalize in its objective function. Consequently, it seems more realistic to assume that the league will internalize only partially the expenses of the clubs. In other words, the true objective function of a league is somewhere in between the maximization of joint revenues and the maximization of aggregate net surplus. Note however, that under this, more elaborate, hypothesis our results would remain unchanged. The reason is that the teams' valuations, just as before, are increasing in α : Hence, as long as the league internalizes somewhat the expenditure of the teams, it will want to minimize it (whenever the price is determined by the valuation of a team from the league in question).

Another seemingly strong assumption that we have made is that the cost of bankruptcy is infinite. In fact, relaxing this assumption would strengthen our results even further. Note that imposing a finite cost of bankruptcy instead, would be equivalent¹¹ to increasing the ex ante wealth of the teams. This would not affect the result of the

¹¹This equivalence only holds in ex ante terms. With small bankruptcy costs, teams would risk bankruptcy and as a consequence they would sometimes go bankrupt (ex post). This possibility could, in principle, induce the league to impose more revenue sharing (lower α): Note, however, that unless a bankrupt team causes negative externalities on the rest of the teams, this difference should not affect the league's behavior (since the team has already internalized the risk). Now, in the case of the top European soccer leagues there is always a Second Division, which can provide a team to fill the bankrupt team's place, thus no externalities are present.

benchmark case. On the other hand, as it can be appreciated from (6) and (8), the relevant curves in Figures 1 and 2 would move North-East, changing the equilibrium set of α 's away from $(1=2; 1=2)$: In the limit as the cost of bankruptcy disappears (or, equivalently, the teams are infinitely wealthy), the only equilibrium that remains is $(1; 1)$: the winner takes it all in both leagues.

Also, we have posited free agency. This assumption also favors revenue sharing. If the teams pay each other for a transfer, the equilibrium in revenue sharing rules would again be $(1; 1)$. To see this, observe that the team owning the rights to the h player would be willing to transfer it for $V^c(\alpha_i)$: On the other hand the team purchasing the h player would be willing to pay $V^c(\alpha_j)$: Since these teams do not internalize the externalities of a transfer on the rest of the teams, both $V^c(\alpha_i)$ and $V^c(\alpha_j)$ are less than the revenues generated for the league by the h player, K . Consequently, each league wants to make sure that the h player ends up in one of its teams, driving the α 's all the way up to one.

Finally, we have considered the case in which teams have only one source of income. Multiple sources of income {each of them subject to revenue sharing allocation by the leagues} would not affect the results, the reason being that an increase in the sharing of any source of revenue decreases the value of top players for teams.

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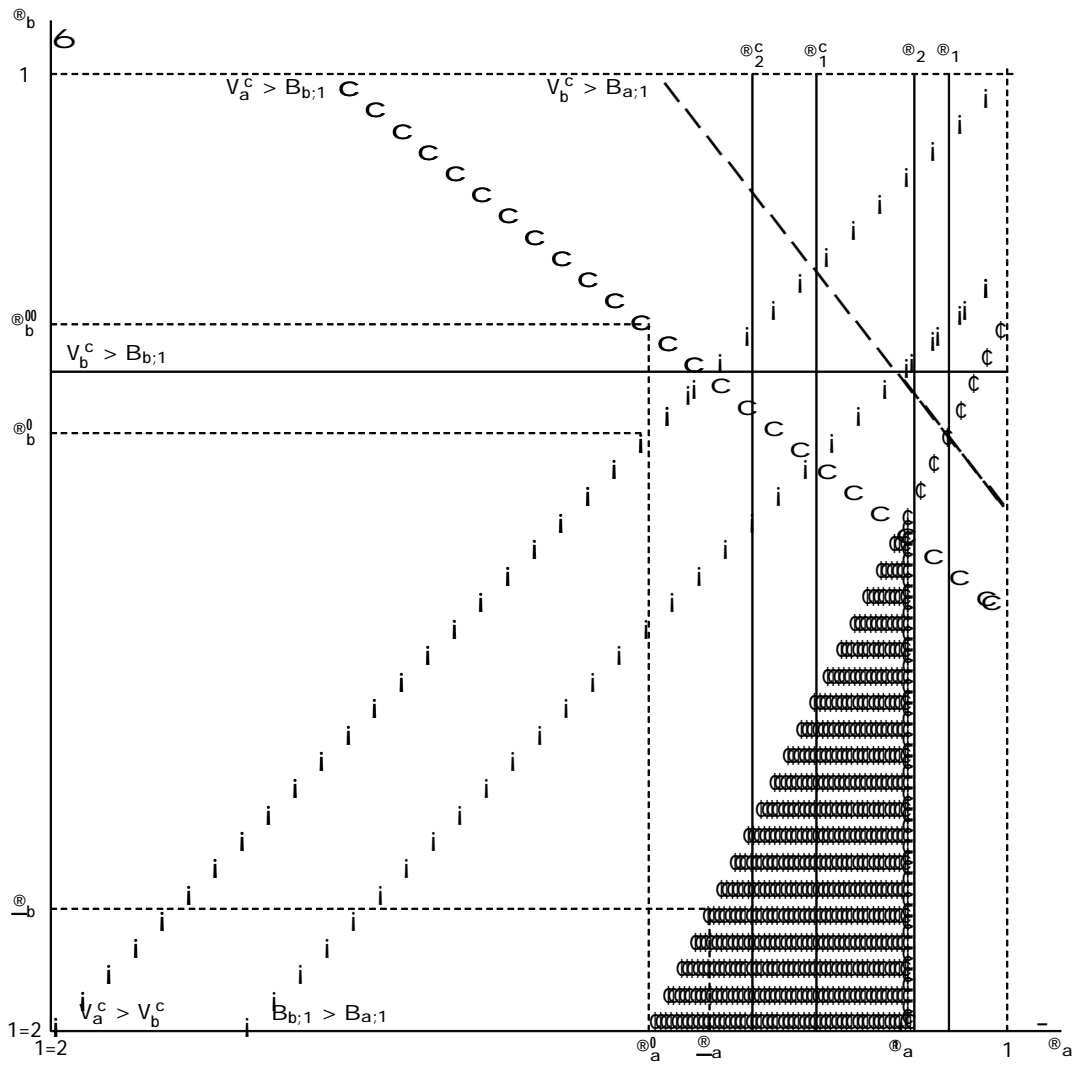


Figure 2:

Ranking	Fixed Amount	Variable Amount	Total
1	54.5	45.5	100
2	54.5	40.25	94.75
3	54.5	36.75	91.25
4	54.5	31.5	86
5	54.5	29.75	84.25
6	54.5	28	82.5
7	54.5	24.5	79
8	54.5	21	75.5
9	54.5	19.25	73.75
10	54.5	17.5	72
11	54.5	14	68.5
12	54.5	10.5	65
13	54.5	8.75	63.25
14	54.5	7	61.5
15	54.5	5.25	59.75
16	54.5	2	56.5
17	54.5	2	56.5
18	54.5	2	56.5

Table 1: Revenue allocation in the LNF (season 1999-2000, in Million FF)

Country	Best/Worst
England	2.2
France	1.8
Germany	1.7
Italy	3.4

Table 2: Ratio of revenues for the season 1999-2000 in some top European soccer leagues